Aerospace Medicine and Life Sciences at John F. Kennedy Space Center

Introduction

Paul Buchanan, M.D.

The need for an effective system to provide on-site medical care for the growing number of civilian workers in the newly created space projects on Cape Canaveral predated the Apollo Program excitement of 1962. When names like "Vanguard," "Jupiter," "Redstone," and "Atlas" were making headlines, civilian technicians, construction workers, and scientists were vying for space with snakes, alligators, and scrub palmetto. A small dispensary, operated by the Air Force on the Cape Canaveral Air Force Station (CCAFS) originally provided "first care." Anything of a serious nature was evacuated to the hospital at Patrick Air Force Base south of Cocoa Beach. As the role of NASA took on a more dominant presence with President Kennedy's lunar mandate and with the steady increase in the civilian population, Occupational Medicine and Environmental Health task orders were added to the contract that provided base support services on "The Cape."

The Author

PAUL BUCHANAN, M.D.

Dr. Buchanan is Director, Biomedical Operations and Research Office, John F. Kennedy Space Center.

While the Mercury and Gemini Projects of the Apollo Program progressed, work began on the Merritt Island Launch Area (MILA). The huge Saturn booster system, designed to support the Apollo lunar launches and the follow-on "Applications Program," required more facilities and space than the Air Force location could provide. In 1964 MILA officially became the John F. Kennedy Space Center (KSC). By 1967 the working population of the center and Cape Canaveral Air Force Station (CCAFS) exceeded 25,000 people. Some construction and processing activities continued around-the-clock. Obviously required services and facilities were equivalent to those of a small city. The "Cold War" and the "Space Race" were in full swing and security was an important part of the program, a situation which dictated a certain level of self-containment.

Programmatic vicissitudes since the halcyon days of Apollo have not lessened concern for the well-being and on-site medical care of the KSC work force. To the contrary, NASA has always assumed an aggressive approach toward the preventive and remedial aspects of health in the work place. As a part of this effort, environmental health has, from the Center's earliest days, received attention at the highest management levels and consistent with the best technology available in the disciplines of industrial hygiene, health physics, and sanitation. Furthermore, in-house research for new and better methods of assessment has frequently been conducted in areas of suspected risk or threat.

Medical concerns ● At no time in our mandate for providing health care are we more taxed than in the hours immediately surrounding the launch of a Shuttle Orbiter. The sheer mass of the Shuttle "stack" and the potential energy of the contained propellants that will push it into space cause us quite logical concern.

We must be ready to support all those associated with its final preflight preparations as well as the astronaut crew. The cryogenics in the huge external tank and toxic hypergolic liquids in the Orbiter's fuel tanks are constant threats that must hold our attention. We add to this task the need to provide emergency care for the tens of thousands of visitors who come to view the launches.

To meet our launch-related obligations, the deployed medical support system includes: our regular cadre of NASA and contractor physicians, nurses, and technicians; a team for astronaut support from the Johnson Space Center; specialists in helicopter medical evacuation techniques from the Department of Defense, and specialists in trauma management from the University of Florida College of Medicine. This establishes a network on the Space Center of medical personnel and equipment to manage, stabilize and evacuate an injured crewperson, Center employee or spectator. Agreements are in effect with several regional hospitals to continue care as required. The intricacies of this multidisciplined medical team involve standard and high technology medical equipment, elaborate communications, and training and integration of personnel to assure performance in the event of a contingency.

Our support for Shuttle landings calls for somewhat less in stand-by medical units for spectators, and the threat to the involved work force is also less demanding. Otherwise our general posture of readiness is similar.

Environmental concerns • The KSC Biomedical Operations and Research Office has been given another fascinating and difficult responsibility outside the usual field of medical concerns. Our technologically dramatic launch and landing activities occur among contiguous properties of the Merritt Island National Wildlife Refuge and the Canaveral National Seashore. In this setting, a truly unique and nearly pristine subtropical coastal and estuarine ecosystem coexists with some of humankind's most advanced and compelling technologies. Among the varied flora and fauna are several threatened and endangered species whose habitat and continued existence must be assured. We are, therefore, charged with environmental and ecosystem surveillance as a major preservation effort.

Our research activities are not limited to the natural environment. On almost all missions there are life sciences studies. Several carry major human, animal, and plant experiments, and some Spacelabs are wholly dedicated to life sciences investigations. Crews are, of course, their own human subjects. In all cases, the preflight support of these experiments becomes the responsibility of KSC, the final common pathway regardless of the origin of the experiment. We maintain dedicated facilities to house plants and animals, for both flight and ground controls. There are resident facilities for flight crews and an extensive laboratory complex that can be configured for the requirements of any investigation for a given mission.

Besides our primary support roles to missions described in greater detail in the accompanying papers, certain concurrent ground-based studies have been conducted in-house over the past two decades. These have mainly capitalized on the strengths of the resident scientists and biomedical engineers and have focused on disciplines required for missions and operational support. Paramount among these activities have been investigations into human cardiovascular and muscle physiological mechanisms in both hypodynamia and exercise, controlled ecological life-support systems (using a totally unique large sealed chamber capable of growing edible crops from seed to seed while monitoring all inputs and outputs under automatic control), and the ecological field studies.

The working environment of the Kennedy Space Center could well be the most professionally stimulating and exciting available for anyone in aerospace and occupational medicine and most of the disciplines involved in space life sciences. The KSC Biomedical Operations and Research Office, its NASA civil servant physicians and scientists, and the dedicated professionals of our two support contractors (EG&G for occupational medicine and environmental health, and Bionetics for life sciences and operational support, and employee fitness facilities) work in the largest and most operationally challenging locale of the Agency. It is as stimulating to our imaginations as it is challenging to our professional competence to continuously improve ourselves and the approach to our tasks. We hope this series of invited papers will be found suitably informative and will convey our sense of excitement and pride in our country's civil space program.

• Dr. Buchanan, Director, Biomedical Operations and Research Office, Mail Code MD, John F. Kennedy Space Center, FL 32899.